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Tierney

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[54] PANEL FOR CONCRETE WALL FORMS

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 843,883, June 4, 1969, abandoned.

[52] **U.S. Cl.** **249/192,** 249/47, 249/196

[51] **Int. Cl.**.....**E04g 11/08**

[58] **Field of Search**... 249/44–47, 189–193, 195–196

[56] **References Cited**

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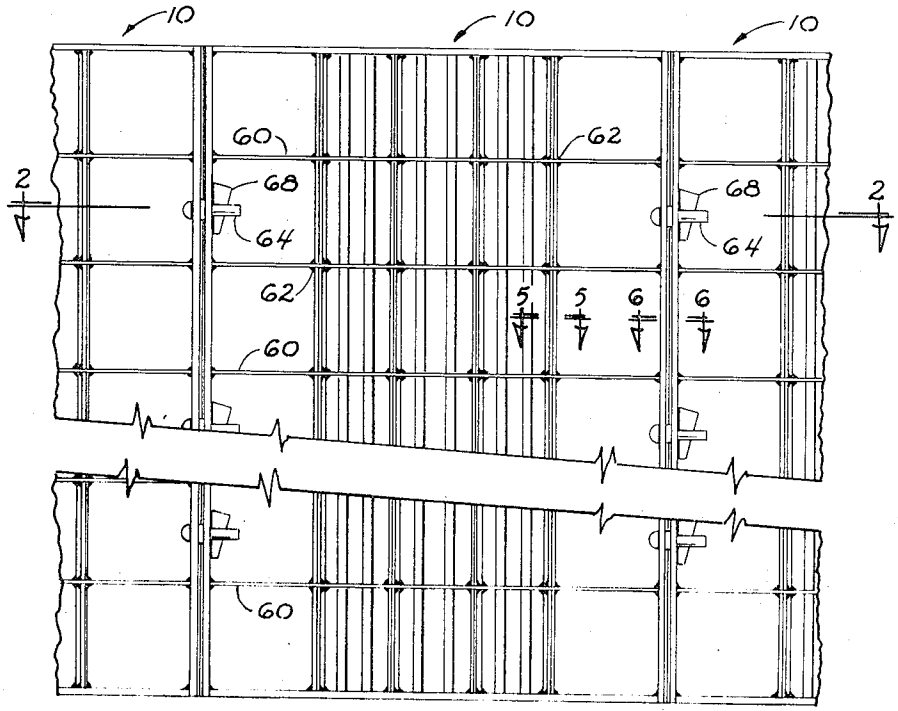
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[57] **ABSTRACT**

A concrete wall form utilizes a plurality of interconnected, unitary metal panels. Each panel is comprised of one or more extruded, channel-shaped intermediate sections and an extruded, channel-shaped end section at either end of the intermediate section. Each section has a pair of spaced flanges separated by an integral connecting portion and the flanges of adjacent sections are disposed in abutting relationship. To assure planar alignment of the connecting portions of the sections each abutting pair of flanges is provided with a V-shaped projection and a complementally configured recess. The projection is self-centering in the recess and accommodates a degree of mismatching between the two abutting sections. The aligned, abutting sections are held as a unitary assembly by a plurality of connecting bars which extend transversely of the longitudinal dimensions of the sections and intersect the flanges. The bars are welded to the sections in a manner to assure that no distortion of the aligned connecting portions takes place during the welding operation.

4 Claims, 7 Drawing Figures



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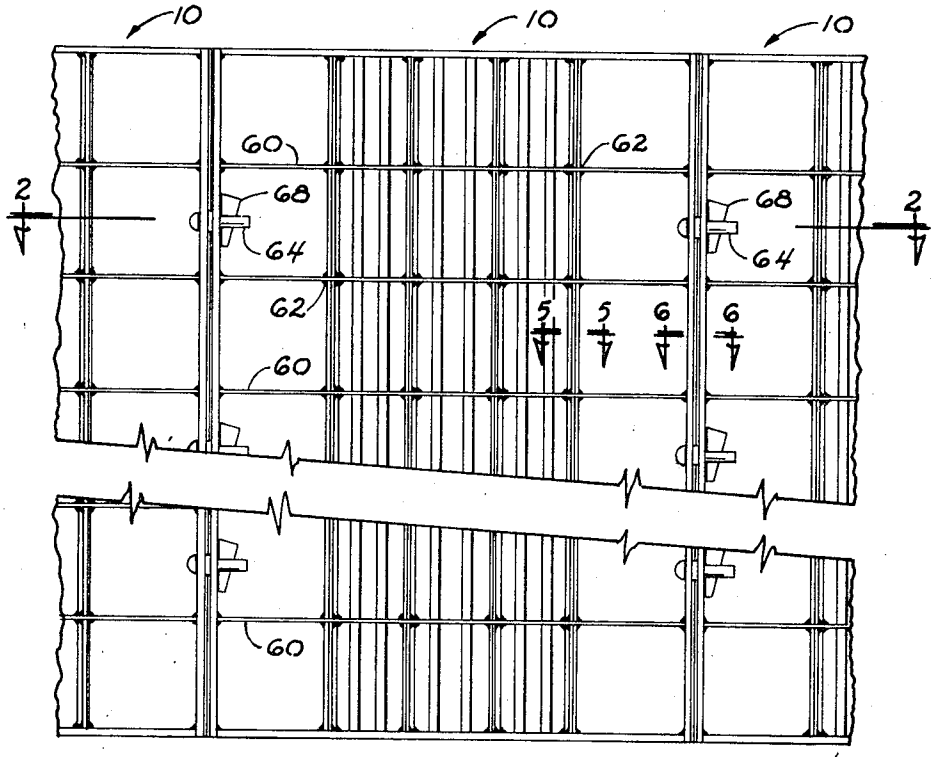


Fig. 1

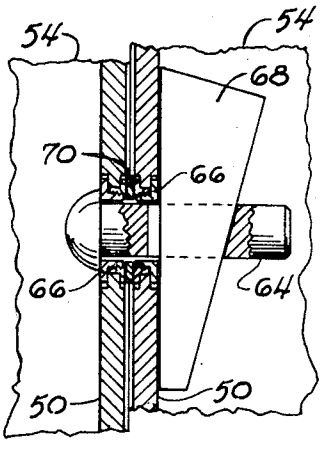


Fig. 3

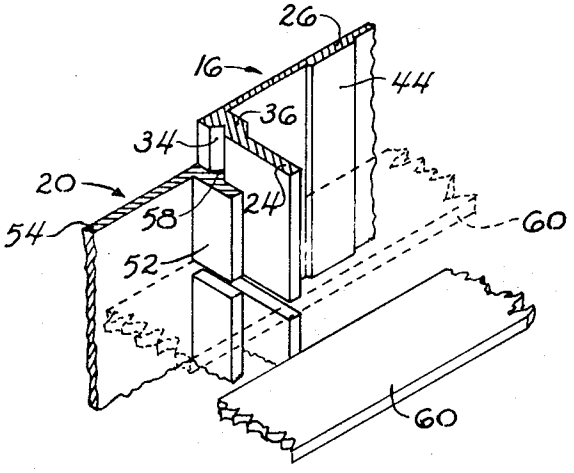


Fig. 7

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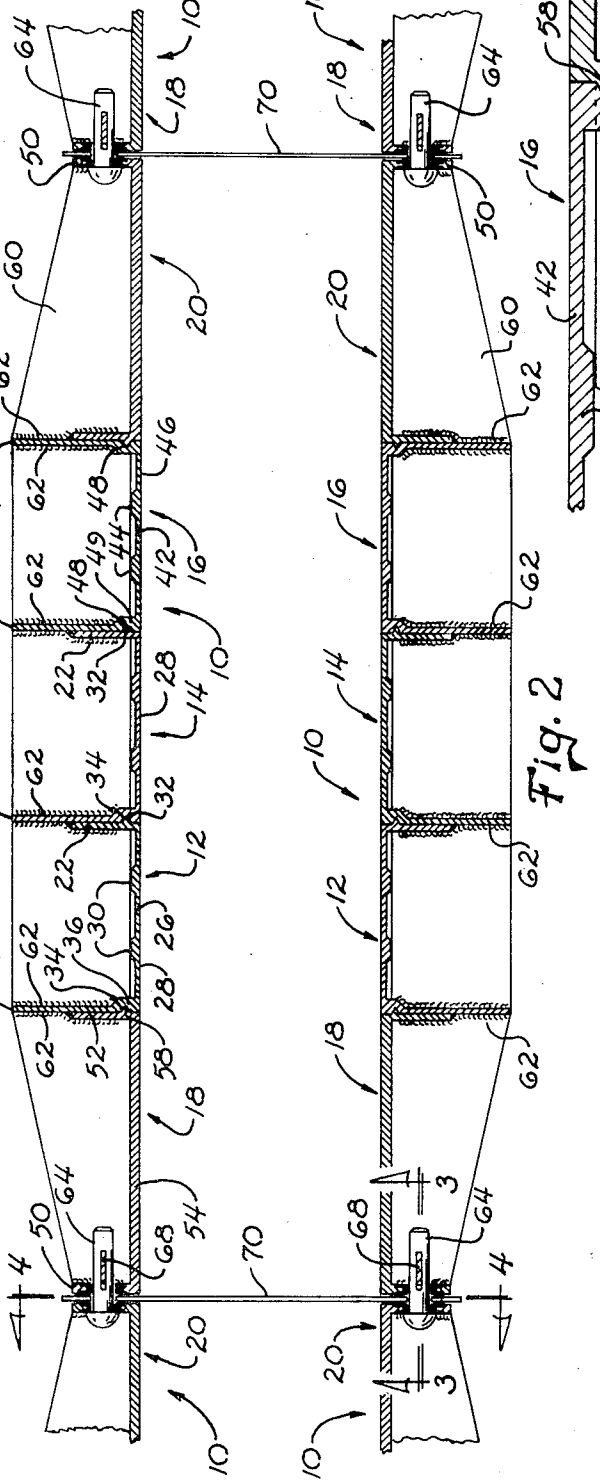


Fig. 2

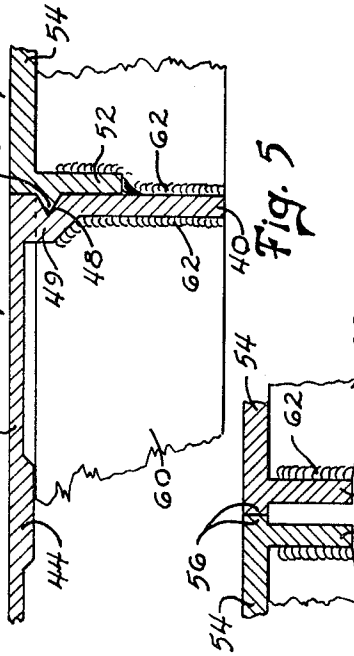


Fig. 5

Fig. 6

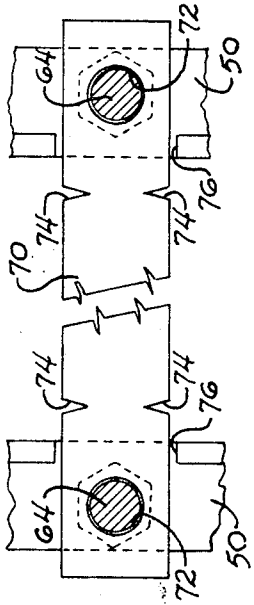


Fig. 4

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PANEL FOR CONCRETE WALL FORMS

This application is a continuation-in-part of my copending application Ser. No. 843,883, filed June 4, 1969 and entitled "Panel For Concrete Wall Forms", now abandoned.

This invention relates to building construction equipment and, more particularly, to the construction of forms for concrete structures.

In modern building construction increasing use is being made of concrete because of its strength, durability, and economy in installation. It has been the predominant practice in the construction industry to use concrete forms constructed from steel with rows of the forms disposed in spaced parallel relationship to receive the concrete therebetween. Because of the considerable weight of steel and its susceptibility to deterioration from moisture and the atmosphere, other metals have been sought from which concrete forms could be satisfactorily constructed.

While an extrusion process offers the most economical method of constructing concrete forms from aluminum, it has been found that when extruded aluminum is formed into a panel for use as a concrete form, there is a degree of bending and bowing which distorts the relatively large planar surface required for the form panel. Reduction of the size of the planar surfaces to thereby minimize distortions is not a satisfactory solution to the problem since it increases the number of individual panels which must be handled and joined together to make a complete form. Additionally, even in relatively small extruded sections there is a degree of bending and bowing of planar surfaces resulting from the extrusion process which requires precise straightening before a plurality of the sections can be joined together to present a panel form. Other problems encountered in constructing aluminum forms include welding of the forms so as to avoid any distortion of the "working surface" during the welding operation, fabrication of the forms into a plurality of form panels of varying size, and proper bracing of the forms to insure adequate strength.

It is therefore an object of the present invention to provide a concrete form which can be constructed from aluminum for weight savings and protection from deterioration of the metal.

An important object of the invention is also to provide an aluminum concrete form which can be constructed utilizing extrusions and wherein large planar surfaces in the individual extrusion sections are avoided.

Another aim of the invention is to provide an aluminum concrete form which can be constructed utilizing extrusions and wherein a form panel is presented by a plurality of individual form sections joined together to thereby minimize distortion in the combined planar surface of the sections without decreasing the overall surface area.

As a corollary to the above object, an important objective of the invention is an aluminum concrete form panel wherein the individual form sections are provided with self-centering aligning means to accommodate a degree of imperfection in the sections and minimize the straightening required before individual sections can be joined together to form a panel.

Another object of the invention is to provide a panel for concrete forms constructed from a plurality of interconnected sections whereby the width of the panel

can be varied by varying the number and size of sections utilized to present the panel.

Another one of the aims of this invention is the provision of a panel of the character described which is adapted to receive a tie rod for connecting the panel with another spaced panel, and wherein the tie rods are received for easy and convenient assembly of the form while reducing to a minimum any interruption of the working face of the form as necessitated by the projection of the tie rod therethrough.

Other objects of the invention will be made clear or become apparent from the following description and claims.

In the drawings:

FIG. 1 is a side elevational view of a panel comprised of a plurality of form sections and joined with a pair of additional panels, one on either side of the first panel;

FIG. 2 is an enlarged horizontal cross-sectional view taken along line 2—2 of FIG. 1 and illustrating details of construction of a pair of spaced form panels;

FIG. 3 is an enlarged vertical cross-sectional view through one of the connecting pins which join a pair of adjacent panels, taken along line 3—3 of FIG. 2;

FIG. 4 is a vertical cross-sectional view through two spaced panels taken along line 4—4 of FIG. 2;

FIG. 5 is a greatly enhanced horizontal cross-sectional view taken along line 5—5 of FIG. 1;

FIG. 6 is another greatly enlarged horizontal cross-sectional view taken along line 6—6 of FIG. 1; and

FIG. 7 is a perspective view of two abutting sections which comprise a panel and illustrating the manner in which the sections receive a transverse cross brace.

Referring initially to FIGS. 1 and 2, a plurality of form panels 10 are disposed in end-to-end relationship in a pair of spaced parallel rows to present a concrete wall form. Each panel 10 is identical and hence only one will be described in detail. Each of the panels 10 is comprised of one or more extruded, C-channel intermediate sections 12, 14 and 16 and a pair of extruded, C-channel end sections 18 and 20. Each of the intermediate sections 12 and 14 has a pair of spaced apart longitudinally extending flanges 22 and 24 which are integral with and extend transversely of a generally planar longitudinally extending connecting bight portion 26.

The face of the connecting portion 26 is planar to present a working surface 28 and the side of the portion 26 which is opposite the surface 28 is provided with a pair of integral reinforcing ribs 30 which give added strength to the panel 10 so that it can withstand the substantial hydraulic pressures exerted by wet concrete. It is to be noted that the flange 24 has a transverse dimension approximately twice the corresponding dimension of the opposite flange 22 to facilitate joining of the section 12 to adjacent sections 14 and 18 on either side as will be made more clear hereinafter. The flange 22 is provided with a V-shaped projection 32 which is coextensive in length with the length of the flange 22, and the flange 24 is provided with a recess 34 which is coextensive in length with the length of the flange 24 and projection 32. The thickness of the flange 24 is increased in the area around the recess 34 to provide integral reinforcing structure 36 in backing relationship to the recess.

The section 14 is identical to the section 12 previously described and is disposed with its flange 24 in abutting relationship to the flange 22 of the section 12 and with the projection 32 of the latter section received

in the recess 34 of the section 14. The section 16 is generally similar to the sections 12 and 14 with a pair of longitudinally extending flanges 38 and 40 both of which are of the same transverse dimension as the flanges 24 on the sections 12 and 14. A generally planar longitudinally extending connecting bight portion 42 is integral with both of the flanges 38 and 40 and is provided with reinforcing ribs 44. The portion 42 also presents a working surface 46. Each of the flanges 38 and 40 has a longitudinally extending recess 48 for complemental engagement with abutting sections 14 and 20. As with the sections 12 and 14, integral reinforcing structure 49 is disposed in backing relationship to each of the recesses 48.

The two end sections 18 and 20 are identical, except for being reversed, with a pair of longitudinally extending flanges 50 and 52 extending transversely of and being integral with a planar longitudinally extending connecting bight portion 54. As illustrated in FIG. 6, the connecting portion 54 extends outwardly in transverse relationship to the flange 50 to present a lip projection 56. The lip projection 56 abuts a similar projection 56 on an adjacent end section 20. The flange 52 is provided with a V-shaped projection 58 identical in configuration to the projection 32 on the sections 12 and 14 and coextensive in length with the length of the flange 52.

For economy of construction, and to present a form panel of uniform cross section, each of the sections 12 through 20 is extruded from aluminum. Since extrusion is feasible only when very large planar surfaces are avoided, it is necessary to construct the panel 10 from a plurality of sections such as 12 through 20 rather than from a single continuous section. This also accommodates a wide variation in the width of the panel 10 by simply varying the number of sections used to form the panel. Also, different size sections can be used to further vary the width of the panel. However, even with the relatively small sections 12–20 a certain degree of bending and bowing of the metal during the extrusion process takes place. It is thus necessary to straighten the sections after extrusion to return them to a planar configuration. The V-shaped projections 32 and 58 and the corresponding recesses 34 and 48 in the sections 12–20 present means for aligning abutting sections, which, because of the V-shape of the projection and the complemental configuration of the recess are self-centering and can accommodate a degree of imperfection in the adjacent sections. This allows the sections to be brought into planar alignment relatively easily and minimizes the degree of straightening required for the sections 12-20 after the extrusion process.

It has also been found to be highly advantageous to locate the V-shaped aligning projections and the corresponding recesses in the flanges of the sections rather than at the ends of the connecting portions which present the planar surfaces to be aligned. As previously mentioned, it is the planar surfaces which are most susceptible to distortion after extrusion. While this distortion, particularly after straightening, is normally so minimal as to not detract from the appearance or structural soundness of the completed concrete wall, such a small degree of imperfection can interfere with alignment of abutting sections. However, by locating the aligning means in the abutting flanges where distortions inherent in the extrusion process are minimized, much more accurate alignment can be accomplished and greater degrees of imperfection in the planar surfaces can be tolerated.

It is also an advantage of locating the aligning means in the flanges that integral reinforcing structure such as 36 and 49 can be provided in backing relationship to the recesses 34 and 48 which would not be possible if the recesses were located in the connecting portions of the sections. This contributes to the overall strength of the panel 10 and reduces the disadvantages of having a plurality of separate individual sections.

Furthermore, by locating the aligning means in the flanges of the sections, any binding forces which are encountered between adjacent sections are distributed over a wider surface area than would otherwise be possible. This minimizes the stress on the means used to interconnect the sections and prolongs the life of the form panel 10.

A plurality of connecting bars 60 extend transversely across each of the panels 10 in vertically spaced relationship as best illustrated in FIGS. 1 and 2. All of the flanges 22, 24 and 52 of the sections 12–20, except for the endmost flanges 50 are provided with notches, as clearly illustrated in FIG. 7, for receiving the connecting bars 60. The bars 60, when received within the notches of the flanges abut the connecting portions 26, 42 and 54. With the bars 60 so disposed, each bar is joined to the flanges of the sections 12–20 by welds 62. Manifestly, as a result of the flanges having a jaw-like "grip" on the connecting bars 60, any stresses between the bars 60 and the sections 12–20 are distributed through the flanges of the sections with minimal forces being encountered by the welds 62. By extending one of the welds 62 at each abutting pair of flanges beyond the edge of the bar 60, the two abutting flanges can be interconnected. This greatly increases the overall strength of the panel 10.

It is imperative that all welding in the vicinity of the connecting portions of the sections 12–20 be avoided to preclude any damage to the working surfaces of the sections during the welding operation. Thus, an inherent advantage of utilizing an extrusion process to form the sections 12–20 is that the flanges of the sections are formed as an integral part of the connecting portions which present the working surfaces. Furthermore, the welds 62 should be spaced from the respective connecting portions to avoid any distortion of the planar surfaces from the welding operation.

Each of the flanges 50 of an end section 18 or 20 has a plurality of openings therein for receiving headed pins 64 to thereby interconnect a pair of abutting panels 10 as illustrated in FIG. 3. The openings in the flanges 50 are provided with bushings 66 which are received in the flanges and are formed from a metal such as hardened steel. The bushings 66 receive the pin 64 which is then secured by means of a wedge 68 that extends through a slot in the pin. As the wedge 68 is driven into place it pulls the adjacent panels 10 tightly together.

To interconnect the two rows of panels 10, a plurality of tie bars 70 are provided for spanning the distance between the rows. Each of the bars 70 has an eye 72 at either end (see FIG. 4) and a pair of notches 74 disposed inwardly from each of the eyes 72. Each adjacent pair of panels 10 are held apart a sufficient distance to accommodate the tie bars 70 as a result of the lips 56. It is to be noted that each lip 56 extends outwardly from a corresponding flange 50 a distance equal to ap-

proximately one-half of the thickness of a tie bar **70**. From viewing FIG. **4**, it will also be noted that each lip **56** has a notch **76** adjacent each opening in the corresponding flange **50** through which a pin **64** extends, to permit insertion of a tie bar **70** in alignment with the openings for the pins **64**. Thus the pins **64** also serve to hold the tie bars **70**. A sufficient number of the tie bars **70** are disposed in vertically spaced relationship between the two rows of panels **10** to prevent the panels from collapsing toward each other before concrete is poured therebetween, and to prevent spreading of the walls by the hydraulic pressure of wet concrete after the concrete is poured between the forms. The notches **74** in the tie bar **70** present lines of weakness to permit the ends of the tie bars to be broken off flush with or below the surface of the hardened concrete walls.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A unitary panel for concrete wall forms, said panel comprising:

an extruded, channel-shaped, metal intermediate section comprising a pair of spaced apart flanges of uniform cross section and a connecting portion of uniform cross section integral with the flanges and having an outermost planar surface;

first and second extruded, channel-shaped metal end sections, each end section comprising a pair of spaced apart flanges of uniform cross section and a connecting portion of uniform cross section integral with the flanges and having an outermost planar surface, said surface of each end section extending outwardly in transverse relationship to one of said flanges to present a lip integral with the surface,

said end sections being disposed at opposite ends of said intermediate section with the other of said flanges of each end section being disposed in abutting side-by-side relationship to a corresponding flange of said intermediate section,

each abutting pair of flanges comprising a V-shaped, self-centering projection protruding from one of the flanges in spaced relationship to an adjacent connecting portion and coextensive in length with the length of a corresponding section, and a recess in the other of the flanges disposed in spaced relationship to an adjacent connecting portion and coextensive in length with the length of a corresponding section, said recess having converging sidewalls complemental to said projection for receiving the latter to hold said sections in planar alignment and cause said connecting portions to present an uninterrupted planar working face, one of said abutting pair of flanges having a greater transverse dimension than the corresponding dimension of the other flange, and said abutting pair of flanges being welded one to the other; and

a plurality of connecting bars extending transversely of the longitudinal dimensions of said sections on the sides of the latter opposite said working face, said bars being disposed in vertically spaced relationship, intersecting the flanges of said intermediate section and said other flanges of said end sections, and extending into abutting relationship to said one flange of each of said end sections, each of the intersected flanges having a notch for receiving said bar, said bars being welded to said flanges with the end of each weld proximal the corresponding connecting portion terminating in spaced relationship to the latter whereby to avoid heat distortion of the latter during the welding operation.

2. The invention of claim **1**, wherein each flange having a recess therein is provided with integral reinforcing structure in backing relationship to said recess for distribution of forces between said sidewalls and said projection.

3. The invention of claim **1**, wherein said notches in said flanges are contiguous with said connecting portions whereby when said connecting bars are received in the notches said bars abut said connecting portions.

4. The invention of claim **3**, wherein said connecting portion of each of said intermediate section includes a plurality of longitudinally extending reinforcing ribs and said connecting bars abut said ribs.

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